In view of the arguments below, Applicant requests withdrawal of the rejection and allowance of the claims.

Rejections under 35 U.S.C. 103(a)

Claims 1-4 were rejected under 35 U.S.C. 103(a) as being unpatentable over Lacoste-Bourgeacq et al. (U.S. Patent 6,042,853) in view of Etchells et al. (U.S. Patent No. 3,410,755). Lacoste-Bourgeacq was cited as teaching digesting sausage casings using cellulase enzyme, and a hydrolysate containing glucose. Etchells was cited as teaching that the microorganisms recited in the claims were known to produce lactic acid from glucose. The Examiner concluded that one skilled in the art would recognize the glucose-containing cellulase-hydrolyzed sausage casing solution of Lacoste-Bourgeacq to be a carbon source for the lactic acid-producing organisms of Etchells, and would have been motivated to use the glucose-containing cellulase-hydrolyzed sausage casing solution of Lacoste-Bourgeacq as a carbon source. The Examiner further states that rather than simply discarding the cellulase-hydrolyzed solution of Lacoste-Bourgeacq, as discussed at column 3, lines 9-11 of Lacoste-Bourgeacq, "one of ordinary skill would have reasonably expected that the glucose-containing solution would have been useful as a carbon source for lactic acid producing bacteria, with minimal processing."

Claims 1-5 were rejected under 35 U.S.C. 103(a) as being unpatentable over Lacoste-Bourgeacq in view of Etchells and further in view of Chahal (U.S. Patent No. 5, 047,332), Madamwar et al. (J. Ferment. Bioengineer 67:424-426, 1989), and Ono (U.S. Patent No. 5,047,332). Lacoste-Bourgeacq and Etchells were cited for the reasons summarized above. The Examiner acknowledged that neither Lacoste-Bourgeacq nor Etchells teaches a method using cellulase contained in or obtained from solid substrate cultivation of a cellulolytic fungus (as required by claim 4) or from *Trichoderma reesei*, *Rhizopus oryzae*, or *Aspergillus niger* (as required by claim 5). However, each of Chalal and Madamwar is cited as teaching the advantages of using *T. reesei* or *A. niger* to produce cellulase to be used in the digestion of waste cellulosic materials to produce glucose for use in subsequent fermentations. The Examiner concluded that "Thus, applicant's claimed use of SSF for producing cellulase to be used in digestion of waste cellulosic sausage casings must be considered obvious." Ono, which the Examiner acknowledges does not disclose solid substrate cultivation to produce cellulase from *R. oryzae*, is cited as establishing that

R. oryzae was known to produce cellulase. The Examiner concluded that one of ordinary skill would have been motivated to use the methods of Chalal and Madamwar to produce cellulase from *R. oryzae*.

Applicant respectfully submits that the Examiner has failed to establish a prima facie case of obviousness, which requires: (1) some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; (2) a reasonable expectation of success; and (3) the art reference or combination of references must teach all of the claim limitations (MPEP 2142). The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991) (MPEP 2143).

The method of the present invention requires treating spent cellulose sausage casings with cellulase and a lactic acid producing microorganism, under suitable conditions to permit conversion of cellulose to lactic acid. Lacoste-Bourgeacq describes an invention that is directed toward using cellulase to remove sausage casings from sausages to produce skinless sausages. However, initial experiments designed to optimize enzyme conditions were performed on spent casings (i.e., casings that had been removed from sausages). Lacoste-Bourgeacq reported that the conversion of cellulose in spent sausage casings treated with cellulase [2 g/l (2,000 IU/ml)] for 28 hours at 50 °C was 'slow'. Better hydrolysis was obtained when the casings were left on the sausages perhaps because the presence of fats and oils from the spent casings interfered with the enzyme activity, or because the enzyme concentration increased to 20 g/l (col. 5, line 45-col. 6, line 68). Lacoste-Bourgeacq also reported that incubation at 50°C gave better conversion that incubation at 40°C or 60°C (col. 6, lines 65-68).

Etchells is cited as disclosing that the claimed microorganisms were known at the time the instant invention was made. Applicant agrees with the Examiner's assertion that the strains used in the claimed methods were known. However, Applicant wishes to point out that Etchells is directed toward developing medium for promoting growth of certain species of lactic acid bacteria, and discusses problems associated with developing media to support the growth of these "fastidious" bacteria (col. 3, lines 35-43). Etchells teaches that even slight changes in medium parameters can unexpectedly affect the ability of lactic acid bacteria to grow. Furthermore,

Applicant notes that Etchells teaches that the optimum growth temperature for the species is 32 or 45°C.

Applicant respectfully disagrees with the Examiner's conclusion that one skilled in the art would have been motivated to use the glucose-containing cellulase-hydrolyzed sausage casing solution of Lacoste-Bourgeacq as a carbon source for the lactic acid producing microorganisms of Etchells, and that the glucose-containing solution would have been useful as a carbon source for lactic acid producing bacteria, with minimal processing. No art of record supports the Examiner's conclusion that a glucose-containing solution produced by cellulase catalyzed hydrolysis of spent sausage casings would be useful as a carbon source for lactic acid producing bacteria.

Applicant notes that the claimed method requires treating spent cellulose sausage casings with cellulase and a lactic acid fermenting microorganism. In the claimed invention, the casings, not a glucose-containing cellulase-hydrolyzed sausage casing solution, are treated with the microorganism, and there need be no processing of the hydrolyzed cellulose solution prior to adding the microorganisms. The references do not combine to teach treating spent sausage casings with cellulase and lactic acid fermenting microorganisms, as required by the claims. Nor does the Examiner assert that the art teaches that combination. In fact, the Examiner states that one skilled in the art would have reasonably expected the glucose-containing solution to be useful as a carbon source for lactic acid fermenting bacteria with minimal processing. The instant claims require treating the spent casings with the cellulase and the microorganism, not treating the casings with cellulase to form a 'glucose containing cellulase-hydrolyzed solution which is minimally processed to provide a carbon source' and then treated with the microorganism.

Applicant respectfully submits that there is no motivation to combine the prior art teachings to make the claimed invention. In fact, the prior art teaches away from making the claimed invention. Conversion of spent sausage casings to glucose is relatively slow and requires a large amount of enzyme. Although slow and inefficient, this conversion takes place at an optimal temperature of 50°C, and less efficiently at 40°C. The optimal temperature for cellulase activity is well above the optimal temperatures for the lactic acid fermenting bacteria. In view of the large number of contaminants present in spent sausage casings that could interfere with or inhibit cellulase activity or growth of microorganisms, the fastidiousness of the lactic acid fermenting bacteria, differences between the optimal temperatures for cellulase

activity and bacterial growth, the unpredictability of factors affecting the growth of fastidious lactic acid producing microorganisms, and bacteria, and the sluggishness of the cellulase enzyme in converting cellulose in spent sausage casings, Applicant respectfully submit that Lacoste-Bourgeacq and Etchells would not teach, suggest, or provide motivation to one skilled in the art to make the claimed invention. Furthermore, the cited art does not suggest a reasonable expectation of success, particularly in light of the factors affecting enzyme activity and bacterial growth, as discussed above.

The ability to conduct the saccharification and fermentation reactions on spent sausage casings at essentially the same time is unexpected, particularly in view of the fact that spent sausage casings typically contain high concentrations of salt, nitrate, and nitrite, which can be inhibitory toward the growth of microorganisms (p. 4, lines 8-10 of the specification).

Simultaneous saccharification and fermentation reduces the number of processing steps involved in converting the sausage casings. Because it is not necessary for the casings to be washed prior to the simultaneous saccharification and fermentation, the production of waste water is minimized, thereby making the process more economically feasible, as well as environmentally friendly. Because fermentation can take place at essentially the same time and under the same conditions as saccharification, it is not necessary to first hydrolyze the cellulose and then further process the glucose-containing hydrolysate prior to fermentation with lactic acid-producing microorganisms.

Furthermore, treating spent sausage casings simultaneously with cellulase and microorganisms that utilize glucose increases the percent conversion of cellulose to glucose, presumably because effectively removing glucose from the system by converting it to other products reduces product inhibition of cellulase activity. In other words, simultaneous saccharification and fermentation promotes the continuous conversion of cellulose to cellooligomers (e.g., cellobiose, cellotriose, cellotetrose, etc.) and glucose, and the continuous conversion of cellooligomers to glucose. Fig. 1 of the specification illustrates this phenomenon for simultaneous saccharification and fermentation of cellulose in the presence of ethanol-producing microorganisms.

Applicant submits that, because claim 1 is patentable over the combination of cited art, claims 2-5, which depend, directly or indirectly from, and further limit, claim 1, are likewise patentable.

Applicant respectfully requests withdrawal of the rejection and allowance of the claims.

No other fee is believed due in connection with this submission. However, if a fee is owed, please charge such fee to deposit account no. 50-0842.

Respectfully submitted,

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